Kaiser Aluminum Corporation, Tacoma
Class II Inspection
April 5-6, 1993

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ABSTRACT

A Class II Inspection was conducted in April 1993 at the Kaiser Aluminum and Chemical Corporation, Tacoma Reduction Plant. The facility discharges industrial process noncontact cooling water and stormwater runoff. The inspection data found Kaiser discharging a good quality effluent for the parameters analyzed. Effluent concentrations were generally within the NPDES permit limitations. With the exception of copper and nickel, effluent priority pollutant concentrations were below the marine acute and chronic EPA Water Quality Criteria. Bioassay testing documented no effluent toxicity. High levels of oil and grease were detected in the 004 storm sewer. Kaiser lacks a flow totalizer. An improved method for measuring flow should be investigated.

INTRODUCTION

An unannounced Class II Inspection was conducted at the Kaiser Aluminum and Chemical Corporation, Tacoma Reduction Plant on April 5-6, 1993. Conducting the inspection were Paul Stasch and Marc Heffner of the Washington State Department of Ecology (Ecology); Toxics, Compliance and Ground Water Investigations Section of the Environmental Investigations and Laboratory Services Program. Michelle Elling of the Manchester Laboratory assisted during the inspection. Don Reif of the Ecology's Industrial Section requested the inspection and also provided on-site assistance. Bob Wheaton, Kaiser's Chief Chemist, accompanied us during the inspection.

The Kaiser facility is located on 96 acres near the head of the Hylebos Waterway. Kaiser operates a primary aluminum smelter and ancillary facilities. The plant has three potlines producing cast sows and drawn wire. Prior to 1974, Kaiser employed a wet scrubber system to control particulates emitted from the potroom reduction cells. The wet scrubbers were replaced after 1974 with dry air pollution control equipment.

The facility discharges to the Blair and Hylebos Waterways under the provisions of NPDES Permit No. 000093-1. The permit was issued on March 23, 1990, modified with an administrative order on February 14, 1992, and expires on September 23, 1994.

Outfall 001 is the industrial wastewater discharge to the Hylebos Waterway. Outfalls 003 and 004 are stormwater discharges into the Taylor Ditch leading to the Hylebos Waterway. Outfall 005 is the industrial wastewater discharge into the Blair Waterway.

Specific objectives of the inspection included:

1. verify compliance with the NPDES permit effluent limits;
2. assess stormwater contamination during a storm event with chemical scans;
3. characterize industrial wastewater toxicity with chemical scans and with bioassays;
4. supplement studies performed by Permittee as required by the NPDES permit; and
5. support NPDES permit renewal process.

PROCEDURES

Ecology collected composite samples from two locations within the facility, at outfall 001 and 005. Ecology used Isco composite samplers to collect equal volumes of sample every 30 minutes for a 24-hour period. The composite sampler intake hose at outfall 001 was positioned just upstream of the effluent flume to the Hylebos Waterway. The composite sampler intake hose at outfall 005 was positioned in the exit port of the manhole. This outfall discharged to the Blair Waterway. A grab-composite sample of the 001 effluent was collected for bioassay testing.

Grab samples were collected at the composite sample locations. Grab samples were scheduled to be collected from two other locations within the facility (003 and 004 outfalls) to assess any contamination of the stormwater run-off by facility operations. However, the lack of precipitation immediately prior to the inspection left the 003 ditch dry. Thus, the inspection objective to assess stormwater contamination during a storm event was not adequately met. The inspection sampling schedule was modified when oils were discovered in the 004 catch basin. A grab sample from the catch basin was collected on April 5, 1993, and another grab was collected from the 004 ditch the following day.

Kaiser also collected a composite of equal volumes of 001 effluent sample over the same 24-hour period. Ecology and Kaiser samples were split for analysis by both the Ecology and Kaiser laboratories. The Kaiser laboratory has been accredited by the Quality Assurance Section of EILS.

Sample station descriptions are presented in Table 1. Sample locations are depicted on Figure 1. Sampling quality assurance/quality control (QA/QC) measures included priority pollutant cleaning of sampling equipment (Appendix A), icing the compositors, and maintaining chain-of-custody on all samples. Samples collected for Ecology analyses were placed on ice and delivered to the Ecology Manchester Laboratory. Samples collected, sampling times and parameters analyzed are summarized on Appendix B. Ecology's analytical methods and laboratories used are identified in Appendix C.

RESULTS AND DISCUSSION

Flow Measurements

No Ecology flow measurements were taken during the inspection. Two problems were noted at the flume of the 001 discharge which would effect the accuracy of flow measurements. First, the flow from the settling pond through the flume is backed up at high tide. Second, there was a back eddy in the throat of the flume. It was also noted that Kaiser had no flow totalizer. Flows are estimated by measuring the height of the flow upstream of the flume every hour. The discharge for the hour is calculated from these measurements. The hourly discharges, when the flows are not backed up by the tide, are averaged yielding Kaiser's daily flows in million gallons per day (MGD).

Quality Assurance/Quality Control (QA/QC)

All samples were received by the laboratory in good condition with chain-of-custody intact. All analyses were performed within the EPA Contract Laboratory Program specified holding times, with the exception of some TSS analyses. These samples exceeded the holding time by one calendar day. All results are considered reliable and can be used noting the data qualifiers provided on the tables.

Table 1 - Sample Station Descriptions - Kaiser, Tacoma - April 1993.

E001	Ecology composite sample collected immediately upstream of the flume at the 001 outfall.
K001	Kaiser composite sample collected at the 001 outfall.
E001A,B	Ecology grab samples collected at the 001 outfall.
E001BA	Ecology grab-composite sample collected at the 001 outfall.
E004	Ecology grab sample collected from the catch basin immediately upstream of the 004 outfall.
004-3	Ecology grab sample collected from the 004 Ditch.
E005	Ecology composite sample collected from the manhole of the 005 discharge.
E005A,B	Ecology grab samples collected from the manhole of the 005 discharge.

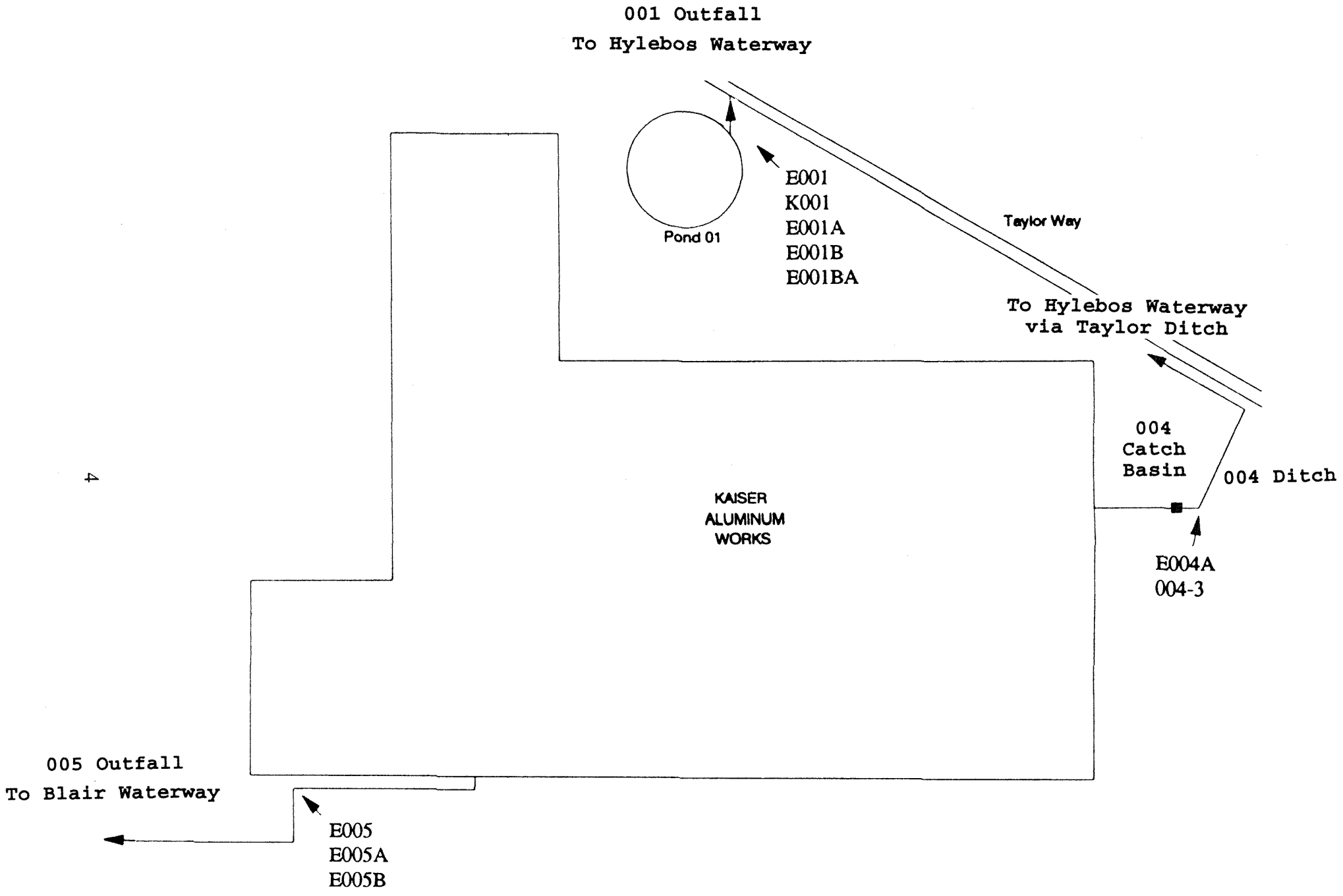

Figure 1 - Sample Station Locations - Kaiser, Tacoma - April 1993.

General Chemistry

The results of the general chemistry analyses are provided on Table 2. The 001 and 005 discharges showed no indications of gross contamination for the limited parameters analyzed during the inspection. The pH of both discharges were near neutral. Total suspended solids were low. Oil and grease concentrations were below detection. Concentrations of the cyanides were at or below the detection limit. Fluoride concentrations of the 001 discharge were approximately 7.6 mg/L. No surface water quality criteria for fluoride exists (USEPA, 1986). Fluoride concentrations of the 005 discharge were less than 1 mg/L. Free cyanide (weak and dissociable) was detected at 2 ug/L in the 001 composite sample.

Conductivities, measured in the field, of the 005 discharge were relatively high. The inspection data reveals nothing to indicate a reason for these elevated conductivities. The cause(s) should be investigated.

On April 5, 1993, the catch basin in the 004 discharge line was contaminated with a substantial amount of oils. These oils were floating in a two/three inch thick layer over the water in the catch basin. The oil layer with some of the water was sampled. Oil and grease concentration approached 30%. At the time, there was no discharge from the catch basin to the 004 ditch.

On April 6, 1993, the catch basin still contained a layer of dark oil over a milky white (presumably an emulsified oil) layer. Water in the ditch contained a milky component which was believed to have originated from the catch basin. The water in the 004 ditch was sampled and oils were detected using both the oil and grease, and the total petroleum hydrocarbon analyses (Table 2).

The Manchester Laboratory was requested to identify the oils. Manchester identified the oils as gear oil (Carrell, 1993). The oils in the catch basin were identical to the emulsified oils present in the 004 ditch sample. This identification was accomplished through GC/MS fingerprinting.

Priority Pollutant Organics - VOA, BNA, PNA and Pesticide/PCB Scans

Priority pollutant organics detected in the Kaiser discharges are summarized on Tables 3 and 4.

No organic priority pollutants were detected in the 005 discharge. A few organic priority pollutants were detected in the 001 discharge.

No volatile organic compounds, pesticides or PCBs were detected in the 001 discharge. Only chrysene was detected using the BNA EPA Method 8240. This compound was detected in the composite sample of the 001 discharge at an estimated concentration of 0.7 ug/L.

Table 2 – General Chemistry Results – Kaiser, Tacoma – April 1993.

Parameter	Location:	E001	K001	E001A	E001B	E004A	E005	E005A	E005B	004-3
	Type:	E-comp	K-comp	grab	grab	grab	E-comp	grab	grab	grab
	Date:	4/5-6	4/5-6	4/5	4/5	4/5	4/5-6	4/5	4/5	4/6
	Time:	@	@	1200	1500	1145	#	1100	1415	1020
	Lab Log #:	158280	158281	158282	158283	158286	158288	158289	158290	158293
GENERAL CHEMISTRY										
Conductivity (umhos/cm)									6120	
pH (SU)		7.6								
Fluoride (mg/L)		7.6	7.7	7.7	7.7		0.67	0.95	1.1	
TSS (mg/L)		18	15	10 O	14 O		2	2 O	2 O	
Oil and Grease (mg/L)				1 U	1 U	297000 J		1 U	1 U	156
Total Petroleum Hydrocarbon (mg/L)										68.8
Cyanide (total)(mg/L)		0.002	<0.002				<0.002			
Cyanide (free)(mg/L)		<0.002	<0.002				<0.002			
FIELD OBSERVATIONS										
Temperature (C)				16.1	18.3			18.1	19.7	
Temp-cooled* (C)		2.7	6.1				3.3			
pH (SU)		7.04	7.85	7.16	7.17		8.24	7.46	7.43	
Conductivity (uS)		287	280	288	290		8930	7800	6200	

E-comp	Ecology composite sample.
K-comp	Kaiser composite sample.
@	Composite sampling period 0840-0840 Hours.
#	Composite sampling period 0930-0930 Hours.
*	Temperature of iced or refrigerated composite sample.
J	The analyte was positively identified. The associated numerical result is an estimate.
O	The sample exceeded the specified holding time prior to analysis.
U	The analyte was not detected at or above the reported result.

Table 3 – BNA and Metals Scan Results – Kaiser, Tacoma – April 1993.

	Location:	E001		K001		E005		EPA Water Quality Criteria Summary (USEPA, 1986)	
	Type:	E-comp		K-comp		E-comp			
	Date:	4/5-6		4/5-6		4/5-6		Acute	Chronic
	Time:	@		@		#		Marine	Marine
	Lab Log#:	158280		158281		158288			
BNA Compounds		ug/L		ug/L		ug/L		(ug/L)	(ug/L)
Chrysene		0.7	J		U		U	300 *(n)	
Metals+									
Aluminum		2230		2200		110	P		
Copper		8.7		9.5			U	2.9	2.9
Nickel		11		10.6		1.1	P	75	8.3
Zinc		47.2		34	P		U	95	86

NOTE: SOME INDIVIDUAL COMPOUND CRITERIA OR LOELS MAY NOT AGREE WITH GROUP CRITERIA OR LOELS. REFER TO APPROPRIATE EPA DOCUMENT ON AMBIENT WATER QUALITY CRITERIA FOR FULL DISCUSSION.

#	Composite sampling period between 0930–0930 Hours.
@	Composite sampling period between 0840–0840 Hours.
U	The analyte was not detected at the limit provided in Appendix D.
J	The analyte was positively identified. The associated numerical result is an estimate.
P	The analyte was detected above the instrument detection limit but below the established minimum quantification limit.
+	All metals analyses were Total Recoverable except Hg which was Total.
*	Insufficient data to develop criteria. Value presented is the LOEL – Lowest Observed Effect Level.
n	Total Polynuclear Aromatic Hydrocarbons

Table 4 – PNA Scan Results – Kaiser, Tacoma – April 1993.

	Location:	E001		K001		E001A		E001B		E005		Water Quality Criteria Summary (USEPA, 1986)		
	Type:	E-comp		K-comp		grab		grab		E-comp				
	Date:	4/5-6		4/5-6		4/5		4/5		4/5-6		Acute		Chronic
	Time:	@		@		PM		PM		#		Marine		Marine
	Lab Log#:	158280		158281		158282		158283		158288				
BNA Compounds		ug/L		ug/L		ug/L		ug/L		ug/L		(ug/L)		(ug/L)
Naphthalene			U		U	0.9	J		U		U	2,350	*	
Fluoranthene		0.1	J		U		U	0.1	J		U	40	*	16 *
Benzo(a)Anthracene		0.03	J		U	0.02	J		U		U	300	*(n)	
Chrysene		0.2	J	0.1	J	0.1	J	0.1	J		U	300	*(n)	
Benzo(b)Fluoranthene		0.2	J	0.2	J	0.2	J	0.2	J		U	300	*(n)	
Benzo(k)Fluoranthene		0.06	J	0.05	J	0.06	J	0.05	J		U	300	*(n)	
Benzo(a)Pyrene		0.03	J		U	0.02	J	0.02	J		U	300	*(n)	
Indeno(1,2,3-cd)Pyrene		0.03	J	0.03	J	0.03	J	0.02	J		U	300	*(n)	
Benzo(g,h,i)Perylene		0.05	J	0.04	J	0.04	J	0.04	J		U	300	*(n)	

NOTE: SOME INDIVIDUAL COMPOUND CRITERIA OR LOELS MAY NOT AGREE WITH GROUP CRITERIA OR LOELS. REFER TO APPROPRIATE EPA DOCUMENT ON AMBIENT WATER QUALITY CRITERIA FOR FULL DISCUSSION.

@ Composite sampling period between 0840-0840 Hours.
# Composite sampling period between 0930-0930 Hours.
U The analyte was not detected at the limit provided in Appendix E.
J The analyte was positively identified. The associated numerical result is an estimate.
* Insufficient data to develop criteria. Value presented is the LOEL – Lowest Observed Effect Level.
n Total Polynuclear Aromatic Hydrocarbons

A number of compounds were detected using the PNA EPA Method 8270. These compounds were detected in both the composite and grab samples of the 001 discharge (Table 4) at estimated concentrations ranging from 0.02 ug/L (benzo(a)pyrene and indeno(1,2,3-cd)pyrene) to 0.9 ug/L (naphthalene). Method 8270 is a more sensitive method with lower detection limits. This method detected chrysene in sample #158280 at an estimated concentration of less than half (0.2 ug/L) of what the BNA method estimated. These PNA compounds were in a different composition and in lower concentrations than those previously detected in Kaiser Ditch water samples (Johnson, *et al.*, 1983). All organics detected were at concentrations below the marine acute and chronic EPA Water Quality Criteria (USEPA, 1986).

A list of target analytes and their detection limits is provided in Appendices D and E.

Priority Pollutant Inorganics - Metals Scans

A few priority pollutant metals were detected in both the 001 and the 005 discharges.

Three priority pollutant metal and one non-priority pollutant metal were detected in the 001 discharge (Table 3). These were copper, nickel and zinc; and aluminum respectively. The priority pollutant metal copper was detected at a concentration nearly three times higher (8.7 ug/L) than the marine acute and chronic EPA Water Quality Criteria (USEPA, 1986). Nickel exceeded the chronic EPA Water Quality Criteria for saltwater (USEPA, 1986). Aluminum does not have an established marine Water Quality Criteria.

Nickel and aluminum were detected in the 005 discharge. Nickel was detected at a concentration below the EPA Water Quality Criterias for saltwater (USEPA, 1986).

A list of target analytes and their detection limits is provided in Appendix D.

NPDES Permit Compliance

Kaiser's compliance with the effluent limitation of their NPDES permit was good (Table 5). Loadings were calculated based on a flow of 0.516 MGD. This flow was derived by proportioning the daily flows estimated by Kaiser on April 5 and 6, 1993, (Schmeil, 1993) to the hours the composite sampler operated.

It should be noted that they have a limit of 3 ug/L for Total PCBs. If the detection limits for all PCB aroclors are added together, the sum yields a "less than concentration" of greater than the permitted effluent limitation (Table 5).

The oils discharge into the 004 ditch discovered during the inspection may be a violation of the Kaiser permit. It should be noted that the 004 outfall has no effluent limitations, only monitoring requirements.

Table 5 – NPDES Effluent Limitation/Ecology Inspection Data Comparison – Kaiser, Tacoma – April 1993.

	NPDES Permit Limitations		Location:	E001	E001A	E001B
	Monthly Average	Daily Maximum	Type:	E-comp	grab	grab
			Date:	4/5-6	4/5	4/5
			Lab Log #:	158280	158282	158283
Suspended Solids*	160 lbs/day	320 lbs/day		77.4		
Fluoride*	80 lbs/day	240lbs/day		32.7		
Aluminum*	25 lbs/day	50 lbs/day		9.6		
Oil and Grease		10 mg/L			1 U	1 U
Benzo(a)pyrene		10 ug/L		0.03 J	0.02 J	0.02 J
Cyanide, Free		10 ug/L		2		
PCBs, Total		3 ug/L		7+ U		
Nickel		0.01 mg/L		0.01		
pH	Shall not be outside the range of 6.0 – 9.0				7.16	7.17

* Loadings based on a flow of 0.516 MGD.
\+ Sum of individual detection limits for PCB aroclors analyzed.
J The analyte was positively identified. The associated numerical result is an estime.
U The analyte was not detected at or above the reported result.

Split Sample Analyses

Kaiser split samples Ecology collected. Only the results from those samples locations which there were effluent limitations specified in the permit were compared. Kaiser reported oil and grease results for sample #158288. This was a composite sample on which Ecology did not run an oil and grease analysis. Thus, the Ecology results for oil and grease analysis on the grab sample #158289 could not be compared.

In general, the results of the splits were good (Table 6). The Ecology analytical results for the Ecology and Kaiser samples compared nicely. This indicates there was little in the way of sampling bias between the two sample locations.

Kaiser's analyses of the Ecology samples compared well to the Ecology analyses. The only discrepancies can be attributed to a difference in the detection limits the laboratories used. For example, Kaiser's contract laboratory's PQL for the free cyanide (weak and dissociable) analyses was 10 ug/L as compared to the Ecology Manchester Laboratory's limit of 2 ug/L. This was true for nickel analyses as well.

Bioassays

Chronic tests were conducted on fathead minnows, Ceriodaphnia and Selenastrum. Acute tests were conducted on fathead minnows, Daphnia and rainbow trout. There were no adverse effects of the 001 effluent on the survival, reproduction or growth of any of the bioassay organisms tested (Table 7).

CONCLUSIONS AND RECOMMENDATIONS

Flow Measurements

No Ecology flow measurements were taken. It was noted that Kaiser did not have a flow totalizer at the 001 discharge. The discharge is estimated by averaging the hourly flows when the discharge is not impeded by the tide. Methods to improve flow measurement accuracy at this discharge should be investigated.

General Chemistry

The quality of the 001 and 005 effluent for the parameters analyzed was good. The conductivity of the 005 discharge was unusually high. There was no apparent reason for the high conductivity. The cause(s) of it should be investigated.

The catch basin upstream of the 004 discharge contained excessive oils. A sample of the water in the 004 ditch indicated that the oils were escaping into the environment and identified them as gear oils. The source of these oils should be determined and their discharge ceased.

Table 6 – Split Sample Results Comparison – Kaiser, Tacoma – April 1993.

		Location:	E001	K001	E001A	E001B	E005	E005A	E005B
		Type:	E-comp	K-comp	grab	grab	E-comp	grab	grab
		Date:	4/5-6	4/5-6	4/5	4/5	4/5-6	4/5	4/5
		Lab Log #:	158280	158281	158282	158282	158288	158289	158290
		Sampler:	Ecology	Kaiser	Ecology	Ecology	Ecology	Ecology	Ecology
PARAMETER	Analyzed by:								
TSS (mg/L)	Ecology		18	15	10 O	14 O	2	2 O	
	Kaiser		17.4	19.8	17.8	17.8	2.3	3.2	
Fluoride (mg/L)	Ecology		7.6	7.7	7.7	7.7	0.67	0.95	1.1
	Kaiser		6.9	7.3	7.1	7.3	0.80	1	0.89
Oil and Grease (mg/L)	Ecology				1 U	1 U			1 U
	Kaiser				0.35	0.41			0.31
Aluminum (ug/L)	Ecology		2230	2200			110 P		
	Kaiser		2200	2200			140		
Nickel (ug/L)	Ecology		11	10.6			1.1		
	Kaiser		11	12			5 U		
Cyanide (free)(ug/L)	Ecology		<2	<2			<2		
	Kaiser		<10	<10			<10		

O The sample exceeded the specified holding time prior to analysis.
P The analyte was detected above the instrument detection limit but below the minimum quantification limit.
U The analyte was not detected at or above the reported result.

Table 7 – Effluent Bioassay Results – Kaiser, Tacoma – April 1993.

NOTE: all tests were run on the effluent (E001BA sample) – lab log # 158291

Fathead Minnow (Pimephales promelas) – 7-Day Chronic Renewal Toxicity Test

Sample	# Tested*	Mean Percent Survival	Mean Dry Weight per Organism
Control	40	93	0.27
6.25 % Effluent	40	90	0.27
12.5 % Effluent	40	93	0.25
25 % Effluent	40	95	0.26
50 % Effluent	40	90	0.28
100 % Effluent	40	95	0.30

* 4 replicates of 10 organisms

LC50 = >100%
NOEC for Survival = 100%
NOEC for Growth = 100%

Selenastrum capricornutum – Static Chronic Toxicity Test

NOEC = 100%

Ceriodaphnia dubia – Chronic Renewal Toxicity Test

Sample	# Tested*	Mean Percent Survival	Mean # Offspring
Control	10	90	14
6.25 % Effluent	10	100	20
12.5 % Effluent	10	100	24
25 % Effluent	10	90	28
50 % Effluent	10	100	28
100 % Effluent	10	100	31

* 10 replicates of 1 organisms

LC50 = >100%
NOEC for Survival = 100%
NOEC for Reproduction = 100%

Table 7 – Effluent Bioassay Results (cont.) – Kaiser, Tacoma – April 1993.

Daphnia pulex – 48–Hour Acute Toxicity Test

Sample	# Tested*	Mean Percent Survival
Control	20	95
6.25 % Effluent	20	80
12.5 % Effluent	20	90
25 % Effluent	20	100
50 % Effluent	20	95
100 % Effluent	20	95

* 4 replicates of 5 organisms

LC50 = >100%
NOEC for Survival = 100%

Fathead Minnow (Pimephales promelas) – 96–Hour Static Acute Definitive Toxicity Test

Sample	# Tested*	Mean Percent Survival
Control	40	95
6.25 % Effluent	40	100
12.5 % Effluent	40	100
25 % Effluent	40	98
50 % Effluent	40	95
100 % Effluent	40	98

* 4 replicates of 10 organisms

LC50 = >100%
NOEC for Survival = 100%

Rainbow trout (Oncorhynchus mykiss) – 96–Hour Static Acute Fish Toxicity Test

Sample	# Tested*	Mean Percent Survival
Control	30	96
65 % Effluent	30	100

* 3 replicates of 10 organisms

NOEC for Survival = 65%

NOEC – no observable effects concentration
LOEC – lowest observable effects concentration
LC50 – lethal concentration for 50% of the organisms
EC50 – effect concentration for 50% of the organisms

Priority Pollutant Organics - VOA, BNA, PNA and Pesticide/PCB Scans

No organic priority pollutants were detected in the 005 discharge. A few were detected in the 001 discharge. Those detected were all PNA compounds. The concentrations of these compounds were less than the marine acute and chronic EPA Water Quality Criteria.

Priority Pollutant Inorganics - Metals Scans

Few metals were detected in the 001 and 005 discharges. Copper, nickel, zinc and aluminum were detected in the 001 discharge. Nickel and aluminum were detected in the 005 discharge.

The copper concentration exceeded the marine acute and chronic EPA Water Quality Criteria and nickel exceeded the marine chronic EPA Water Quality Criteria in the 001 discharge.

NPDES Permit Compliance

NPDES permit compliance at the 001 outfall was good. Ecology's samples indicated Kaiser was in compliance with this effluent parameter.

It should be determined if Kaiser violated the provisions of their permit with the discharge of oils into the 004 ditch.

Split Sample Analyses

Results of split sample analyses were good. The only discrepancy came when there were different detection limits used between the Ecology and Kaiser laboratories.

Bioassays

The results of the whole effluent toxicity testing documented the Kaiser 001 effluent was not toxic to the organisms tested.

General

The inspection was originally scheduled to coincide with a significant storm event to investigate the potential for stormwater contamination. The extended dry period which proceeded the inspection made this objective unobtainable. Another attempt to collect stormwater quality data should be made.

REFERENCES

Carrell, B., 1993. Memorandum. April 27, 1993. Washington State Department of Ecology.

Johnson, A., B. Yake, and D. Norton, 1983. A Summary of Priority Pollutant Data for Point Sources and Sediments in Inner Commencement Bay: A Preliminary Assessment of Data and Considerations for Future Work. Part 1. Hylebos Waterway. Washington State Department of Ecology.

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USEPA, 1986. Quality Criteria for Water, 1986. EPA 440/5-86-001, Office of Water Regulations and Standards, Washington, D.C.

APPENDICES

Appendix A - Priority Pollutant Cleaning Methodology - Kaiser, Tacoma - April 1993.

Priority Pollutant Cleaning Methodology

1. Wash with laboratory grade detergent (Liqui-Nox).
2. Rinse several times with tap water.
3. Rinse with 10% nitric acid solution.
4. Rinse three (3) times with distilled/deionized water.
5. Rinse with reagent-grade methylene chloride.
6. Rinse with reagent-grade acetone.
7. Allow to air dry and seal with aluminum foil.

Appendix B – Ecology Samples Schedule and Parameters Analyzed – Kaiser, Tacoma – April 1993.

Parameter	Location:	E001	K001	E001A	E001B	E001BA	E004A	E005	E005A	E005B	004-3
	Type:	E-comp	K-comp	grab	grab	grab-comp	grab	E-comp	grab	grab	grab
	Date:	4/5-6	4/5-6	4/5	4/5	4/5	4/5	4/5-6	4/5	4/5	4/6
	Time:	@	@	PM	PM	PM	AM	#	AM	PM	AM
	Lab Log #:	158280	158281	158282	158283	158291	158286	158288	158289	158290	158293
GENERAL CHEMISTRY											
Conductivity										1	
pH		1									
Fluoride		1	1	1	1			1	1	1	
TSS		1	1	1	1			1	1	1	
Oil and Grease				1	1		1		1	1	1
Total Petroleum Hydrocarbon											1
Cyanide (total)		1	1					1			
Cyanide (free)		1	1					1			
ORGANICS											
VOA				1	1				1	1	
BNA		1						1			
PNA		1	1	1	1			1			
Pesticide/PCB		1						1			
METALS											
PP Metals		1	1					1			
BIOLOGY											
Salmonid (acute)						1					
Fathead Minnow (acute)						1					
Daphnia pulex (acute)						1					
Fathead Minnow (chronic)						1					
Ceriodaphnia dubia (chronic)						1					
Algal (chronic)						1					
FIELD OBSERVATIONS											
Temperature				1	1				1	1	
Temp-cooled*		1	1					1			
pH		1	1	1	1			1	1	1	
Conductivity		1	1	1	1			1	1	1	

E-comp	Ecology composite sample.
K-comp	Kaiser composite sample.
@	Composite sampling period 0840-0840 Hours.
#	Composite sampling period 0930-0930 Hours.
*	Temperature of iced or refrigerated composite sample.

Appendix C – Ecology Analytical Methods and Laboratories Used – Kaiser, Tacoma – April 1993.

PARAMETER	MANCHESTER METHODS	LABORATORY USED
pH	EPA, Revised 1983: 150.1	Manchester
Fluoride	EPA, Revised 1983: 340.3	Manchester
TSS	EPA, Revised 1983: 160.2	Manchester
Oil and Grease (water)	EPA, Revised 1983: 413.1	Manchester
Total Petroleum Hydrocarbon	EPA, Revised 1983: 418.1	Manchester
Cyanide (total)	EPA, Revised 1983: 335.2	Manchester
Cyanide (wk & dis)	EPA, Revised 1983: 335.3T	Manchester
VOC (water)	EPA, Revised 1983: 8260	Analytical Resources Incorporated
BNAs (water)	EPA, Revised 1983: 8240	Analytical Resources Incorporated
PNAS (water)	EPA, Revised 1983: 8270	Analytical Resources Incorporated
Pest/PCBs (water)	EPA, Revised 1983: 8080	Analytical Resources Incorporated
PP Metals	EPA, Revised 1983: 200–299	Manchester
Salmonid (acute 100%)	Ecology, revised 1992: 80–12	Parametrix Incorporated
Fathead Minnow (acute)	EPA, Revised 1990: 600/4–90/027	Parametrix Incorporated
Daphnia pulex (acute)	EPA, Revised 1990: 600/4–90/027	Parametrix Incorporated
Fathead Minnow (chronic)	EPA, Revised 1989: 600/4–89/001	Parametrix Incorporated
Ceriodaphnia dubia (chronic)	EPA, Revised 1989: 600/4–89/001	Parametrix Incorporated
Algal (chronic)	EPA, Revised 1989: 600/4–89/001	Parametrix Incorporated

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EPA, Revised 1983. Methods for Chemical Analysis of Water and Wastes, EPA–600/4–79–020 (Rev. March, 1983).

EPA, 1989. Short–term Methods for Estimating the Chronic Toxicity of Effluents and Receiving waters to Freshwater Organisms. Second edition. EPA/600/4–89/001.

EPA, Revised 1990. Methods for Measuring the Acute Toxicity of Effluents to Freshwater and Marine Organisms. EPA/600/4–90/027.

Appendix D - VOA, BNA, Pesticide/PCB and Metals Scan Results - Kaiser, Tacoma - April 1993.

Location:	E001	K001	E001A	E001B	E005A	E005B	E005
Type:	E-comp	K-comp	grab	grab	grab	grab	E-comp
Date:	4/5-6	4/5-6	4/5	4/5	4/5	4/5	4/5-6
Lab Log#:	158280	158281	158282	158283	158289	158290	158288
VOA Compounds	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
Chloromethane			2 U	2 U	2 U	2 U	
Bromomethane			2 U	2 U	2 U	2 U	
Vinyl Chloride			2 U	2 U	2 U	2 U	
Chloroethane			2 U	2 U	2 U	2 U	
Methylene Chloride			2 U	2 U	2 U	2 U	
Acetone			5 U	5 U	5 U	5 U	
Carbon Disulfide			1 U	1 U	1 U	1 U	
1,1-Dichloroethene			1 U	1 U	1 U	1 U	
1,1-Dichloroethane			1 U	1 U	1 U	1 U	
1,2-Dichloroethene (total)			1 U	1 U	1 U	1 U	
Chloroform			1 U	1 U	1 U	1 U	
1,2-Dichloroethane			1 U	1 U	1 U	1 U	
2-Butanone (MEK)			5 U	5 U	5 U	5 U	
1,1,1-Trichloroethane			1 U	1 U	1 U	1 U	
Carbon Tetrachloride			1 U	1 U	1 U	1 U	
Bromodichloromethane			1 U	1 U	1 U	1 U	
1,2-Dichloropropane			1 U	1 U	1 U	1 U	
cis-1,3-Dichloropropene			1 U	1 U	1 U	1 U	
Trichloroethene			1 U	1 U	1 U	1 U	
Dibromochloromethane			1 U	1 U	1 U	1 U	
1,1,2-Trichloroethane			1 U	1 U	1 U	1 U	
Benzene			1 U	1 U	1 U	1 U	
trans-1,3-Dichloropropene			1 U	1 U	1 U	1 U	
Bromoform			1 U	1 U	1 U	1 U	
4-Methyl-2-Pentanone (MIBK)			5 U	5 U	5 U	5 U	
2-Hexanone			5 U	5 U	5 U	5 U	
Tetrachloroethene			1 U	1 U	1 U	1 U	
1,1,2,2-Tetrachloroethane			1 U	1 U	1 U	1 U	
Toluene			1 U	1 U	1 U	1 U	
Chlorobenzene			1 U	1 U	1 U	1 U	
Ethylbenzene			1 U	1 U	1 U	1 U	
Styrene			1 U	1 U	1 U	1 U	
Total Xylenes			2 U	2 U	2 U	2 U	
Trichlorofluoromethane			2 U	2 U	2 U	2 U	
1,1,2-Trichlorotrifluoroethane			2 U	2 U	2 U	2 U	
BNA Compounds							
Phenol	2 U						2 U
Bis(2-Chloroethyl)Ether	1 U						1 U
2-Chlorophenol	1 U						1 U
1,3-Dichlorobenzene	1 U						1 U
1,4-Dichlorobenzene	1 U						1 U
Benzyl Alcohol	5 UJ						5 UJ
1,2-Dichlorobenzene	1 U						1 U
2-Methylphenol	1 U						1 U
Bis(2-Chloroisopropyl)Ether	1 U						1 U

Appendix D - VOA, BNA, Pesticide/PCB and Metals Scan Results (cont.) - Kaiser, Tacoma - April 1993.

Location:	E001	K001	E001A	E001B	E005A	E005B	E005
Type:	E-comp	K-comp	grab	grab	grab	grab	E-comp
Date:	4/5-6	4/5-6	4/5	4/5	4/5	4/5	4/5-6
Lab Log#:	158280	158281	158282	158283	158289	158290	158288
BNA Compounds	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
4-Methylphenol	1 U						1 U
N-Nitroso-di-n-Propylamine	1 U						1 U
Hexachloroethane	2 U						2 U
Nitrobenzene	1 U						1 U
Isophorone	1 U						1 U
2-Nitrophenol	5 U						5 U
2,4-Dimethylphenol	2 U						2 U
Benzoic Acid	10 U						10 U
Bis(2-Chloroethoxy)Methan	1 U						1 U
2,4-Dichlorophenol	3 U						3 U
1,2,4-Trichlorobenzene	1 U						1 U
Naphthalene	1 U						1 U
4-Chloroaniline	3 U						3 U
Hexachlorobutadiene	2 U						2 U
4-Chloro-3-Methylphenol	2 U						2 U
2-Methylnaphthalene	1 U						1 U
Hexachlorocyclopentadiene	5 U						5 U
2,4,6-Trichlorophenol	5 U						5 U
2,4,5-Trichlorophenol	5 U						5 U
2-Chloronaphthalene	1 U						1 U
2-Nitroaniline	5 U						5 U
Dimethyl Phthalate	1 U						1 U
Acenaphthylene	1 U						1 U
2,6-Dinitrotoluene	5 U						5 U
3-Nitroaniline	5 U						5 U
Acenaphthene	1 U						1 U
2,4-Dinitrophenol	10 U						10 U
4-Nitrophenol	5 U						5 U
Dibenzofuran	1 U						1 U
2,4-Dinitrotoluene	5 U						5 U
Diethyl Phthalate	1 U						1 U
4-Chlorophenyl Phenylether	1 U						1 U
Fluorene	1 U						1 U
4-Nitroaniline	5 U						5 U
4,6-Dinitro-2-Methylphenol	10 U						10 U
N-Nitrosodiphenylamine	1 U						1 U
4-Bromophenyl Phenylether	1 U						1 U
Hexachlorobenzene	1 U						1 U
Pentachlorophenol	5 U						5 U
Phenanthrene	1 U						1 U
Anthracene	1 U						1 U
Di-n-Butyl Phthalate	2.7 U						1.6 U
Fluoranthene	1 U						1 U
Pyrene	1 U						1 U
Butylbenzyl Phthalate	1 U						1 U
3,3'-Dichlorobenzidine	5 U						5 U

Appendix D - VOA, BNA, Pesticide/PCB and Metals Scan Results (cont.) - Kaiser, Tacoma - April 1993.

Location:	E001	K001	E001A	E001B	E005A	E005B	E005
Type:	E-comp	K-comp	grab	grab	grab	grab	E-comp
Date:	4/5-6	4/5-6	4/5	4/5	4/5	4/5	4/5-6
Lab Log#:	158280	158281	158282	158283	158289	158290	158288
BNA Compounds	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
Benzo(a)Anthracene	1 U						1 U
Chrysene	0.7 J						1 U
Bis(2-Ethylhexyl)Phthalate	1 U						1 U
Di-n-Octyl Phthalate	1 U						1 U
Benzo(b)Fluoranthene	1 U						1 U
Benzo(k)Fluoranthene	1 U						1 U
Benzo(a)Pyrene	1 U						1 U
Indeno(1,2,3-cd)Pyrene	1 U						1 U
Dibenzo(a,h)Anthracene	1 U						1 U
Benzo(g,h,i)Perylene	1 U						1 U
Pesticide/PCB Compounds							
alpha-BHC	0.05 U						0.05 U
beta-BHC	0.05 U						0.05 U
delta-BHC	0.05 U						0.05 U
gamma-BHC (Lindane)	0.05 U						0.05 U
Heptachlor	0.05 U						0.05 U
Aldrin	0.05 U						0.05 U
Heptachlor Epoxide	0.05 U						0.05 U
Endosulfan I	0.05 U						0.05 U
Dieldrin	0.1 U						0.1 U
4,4'-DDE	0.1 U						0.1 U
Endrin	0.1 U						0.1 U
Endosulfan II	0.1 U						0.1 U
4,4'-DDD	0.1 U						0.1 U
Endosulfan Sulfate	0.1 U						0.1 U
4,4'-DDT	0.1 U						0.1 U
Methoxychlor	0.5 U						0.5 U
Endrin Ketone	0.1 U						0.1 U
alpha-Chlordane	0.05 U						0.05 U
gamma-Chlordane	0.05 U						0.05 U
Toxaphene	5 U						5 U
Aroclor-1016	1 U						1 U
Aroclor-1221	2 U						2 U
Aroclor-1232	1 U						1 U
Aroclor-1242	1 U						1 U
Aroclor-1248	1 U						1 U
Aroclor-1254	1 U						1 U
Aroclor-1260	1 U						1 U
Endrin Aldehyde	0.1 UJ						0.1 UJ

Appendix D – VOA, BNA, Pesticide/PCB and Metals Scan Results (cont.) – Kaiser, Tacoma – April 1993.

	Location:	E001		K001		E001A	E001B	E005A	E005B	E005	
	Type:	E–comp		K–comp		grab	grab	grab	grab	E–comp	
	Date:	4/5–6		4/5–6		4/5	4/5	4/5	4/5	4/5–6	
	Lab Log#:	158280		158281		158282	158283	158289	158290	158288	
Metals*		ug/L		ug/L		ug/L	ug/L	ug/L	ug/L	ug/L	
Aluminum		**2230**		**2200**						**110**	P
Antimony		30	U	30	U					30	U
Arsenic		30	U	30	U					30	U
Beryllium		1	U	1	U					1	U
Cadmium		2	U	2	U					2	U
Chromium		5	U	5	U					5	U
Copper		**8.7**		**9.5**						1	U
Lead		20	U	20	U					20	U
Mercury		0.05	U	0.05	U					0.05	U
Nickel		**11**		**10.6**						**1.1**	P
Selenium		50	U	50	U					50	U
Silver		3	U	3	U					3	U
Thallium		50	U	50	U					50	U
Zinc		**47.2**		**34**	P					4	U

* All metals were Total Recoverable except Hg which was Total.
B Analyte was also found in the analytical method blank indicating the sample may have been contaminated.
J The analyte was positively identified. The associated numerical result is an estimate.
N For organic analytes there is evidence the analyte is present in the sample. For metals analytes the spike sample recovery is not with in control limits.
P The analyte was detected above the instrument detection limit but below the established minimum quantification limit.
U The analyte was not detected at or above the reported result.
UJ The analyte was not detected at or above the reported estimated result.

Appendix E - PNA Scan Results - Kaiser, Tacoma - April 1993.

Location:	E001		K001		E001A		E001B		E005	
Type:	E-comp		K-comp		grab		grab		E-comp	
Date:	4/5-6		4/5-6		4/5		4/5		4/5-6	
Lab Log#:	158280		158281		158282		158283		158288	
	ug/L		ug/L		ug/L		ug/L		ug/L	
PNA Compounds										
Naphthalene	1.8	U	1.8	U	0.9	J	1.8	U	1.8	U
Acenaphthylene	2.3	U	2.3	U	2.3	U	2.3	U	2.3	U
Acenaphthene	1.8	U	1.8	U	1.8	U	1.8	U	1.8	U
Fluorene	0.21	U	0.21	U	0.21	U	0.21	U	0.21	U
Phenanthrene	0.64	U	0.64	U	0.64	U	0.64	U	0.64	U
Anthracene	0.66	U	0.66	U	0.66	U	0.66	U	0.66	U
Fluoranthene	0.1	J	0.21	U	0.21	U	0.1	J	0.2	U
Pyrene	0.27	U	0.27	U	0.27	U	0.27	U	0.27	U
Benzo(a)Anthracene	0.03	J	0.03	U	0.02	J	0.03	J	0.03	U
Chrysene	0.2	J	0.1	J	0.1	J	0.1	J	0.2	U
Benzo(b)Fluoranthene	0.2	J	0.2	J	0.2	J	0.2	J	0.05	U
Benzo(k)Fluoranthene	0.06	J	0.05	J	0.06	J	0.05	J	0.05	U
Benzo(a)Pyrene	0.03	J	0.02	J	0.02	J	0.02	J	0.04	U
Indeno(1,2,3-cd)Pyrene	0.03	J	0.03	J	0.03	J	0.02	J	0.04	U
Dibenzo(a,h)Anthracene	10	U	10	U	10	U	10	U	0.1	U
Benzo(g,h,i)Perylene	0.05	J	0.04	J	0.04	J	0.04	J	0.08	U

E-comp Ecology composite sample.
K-comp Kaiser composite sample.
J The analyte was positively identified. The associated numerical result is an estimate.
U The analyte was not detected at or above the reported result.